

### **REMARKS**

Claims 1-15 are pending in the instant application. The abstract of the disclosure is objected to because it is not provided in a separate page in compliance with U.S. practice. Claims 1-15 stand rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1-15 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Driehuys (US Patent No. 6,696,040). The application has been amended. The claims have been amended. Applicants respectfully submit that none of the amendments constitute new matter in contravention of 35 U.S.C. § 132. Reconsideration is respectfully requested.

The claims have been amended as follows:

**Claim 1** is based on previous claim 1, 7(now cancelled) and the common features of the hyperpolarized sample and pulse sequence cited in previous claims 9 and 10, now cancelled. Claim 1 has been amended by:

- limiting it to “a method of performing two-dimensional Nuclear Magnetic Resonance (NMR) spectroscopy on a hyperpolarized sample and analyzing a two-dimensional NMR spectrum obtained by said NMR spectroscopy in order to obtain a characterization of the sample”. Basis can be found in previous claims 7, 9 and 10 relating to two-dimensional NMR and in previous claim 1 where an NMR spectrum is obtained (“producing.....NMR spectrum”) and analyzed.
- specifying that the hyperpolarised sample of claim 1 is a hyperpolarised sample which comprises a “first nuclear spin species (I) and a second nuclear spin species (S), with the Hamiltonian  $H = H_S + H_{IS} + H_I$ . Basis for this amendment can be found in previous claims 9 and 10 and in the description on page 14, lines 13-21.
- Specifying that the hyperpolarised sample is transferred into the liquid state. Basis can be found on page 6, line 15.

- specifying that the pulse sequence is adapted for a hyperpolarized sample in such a way that it “uses a single scan, an efficient trajectory in a  $t_s$ - $t_l$  plane and produces a square array of observed points in a square portion of a two-time space”. Basis for this amendment can be found on page 14, line 13 for the feature “single scan”, page 15, lines 17-18 for the feature “an efficient trajectory in a  $t_s$ - $t_l$  plane” and page 15, lines 18-19 for the feature “produces a square array of observed points in a square portion of a two-time space.
- limiting the use of the pulse sequence on the same nuclei to address the Examiner’s claim rejections under 35 U.S.C. 112.

**Claim 14** is based on previous claim 14 and has been amended by:

- adding the wording “wherein the pulse sequence spans a trajectory in the two-dimensional evolution time space ( $t_s$ ,  $t_{IS}$ )” to adapt it to claim 1. Basis can be found on page 15, lines 15-19.
- specifying the performance of the pulses I and IS in steps (305), (315) and (325). Basis for the amendment can be found on page 15, line 4 where it is stated that all the pulses following the initial pulse are  $180^\circ$  pulses.

**Claim 15** is based on previous claim 10 and has been amended by:

- adding the wording “wherein the pulse sequence spans a trajectory in the two-dimensional evolution time space ( $t_s$ ,  $t_{IS}$ )”. Basis can be found on page 15, lines 15-19.
- specifying the performance of the pulses I and IS in steps (305b), (315b) and (325b). Basis for the amendment can be found on page 15, line 4 where it is stated that all the pulses following the initial pulse are  $180^\circ$  pulses.

**New claim 16** is based on claim 1 with the use of the pulse sequence limited to different nuclei and said claim was introduced to address the Examiner’s claim rejections under 35 U.S.C. 112.

**New claims 17 and 18** are based on claims canceled claims 14 and 15.

The abstract of the disclosure is objected to because it is not provided in a separate page in compliance with U.S. practice. This objection is respectfully traversed.

The Office cited MPEP §108.01(b) for support of the objection. However this section of the MPEP cites 37 CFR §1.72 which notes that this requirement only applies to applications filed under 35 USC §111(a). In fact, Examiner Note 2 of MPEP §108.01(b), the MPEP directs that the form paragraph provided should not be used “during the national stage prosecution of international applications (“371 applications) if an abstract was published with the international application under PCT Article 21.

The instant application is a Section 371 application which entered the U.S. national phase from an international application. The international application, published as WO2004/090563, included an abstract. As such, the instant application is not required to include a separate abstract. Reconsideration and withdrawal of the objection are respectfully requested.

Claims 1-15 stand rejected under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection is respectfully traversed.

The Office objected to the recitation “either on the same nuclei or on different nuclei” in the claims. This phrase has been deleted from claim 1 and claim 1 has been limited to the first embodiment, i.e. “on the same nuclei”. The second embodiment, i.e. on different nuclei, has been made subject matter of newly presented claim 16.

Additionally, in order to address the Office’s rejection, the phrase “characterization of the sample or interim result” has been deleted from claim 1 and claim 1 has been limited to the “characterization of the sample”.

In claims 14 and 15, the parentheses were deleted.

Applicants thus believe that the objections under 35 U.S.C 112, second paragraph have been obviated by these amendments. Reconsideration and withdrawal of the rejection of the rejection are respectfully requested.

Claims 1-15 stand rejected under 35 U.S.C. § 102 (e) as being anticipated by Driehuys (US Patent No. 6,696,040). This rejection is respectfully traversed.

As the Examiner correctly points out, Driehuys describes the hyperpolarisation on  $^{129}\text{Xe}$  and the performance of NMR spectroscopy in the sample using a sequence of rf pulses. Spectra are obtained and analyzed to characterize the sample.

The hyperpolarized sample of Driehuys,  $^{129}\text{Xe}$ , is however not a sample that comprises a first and a second nuclear species, as it is required for the sample of the claims of the present application.  $^{129}\text{Xe}$  is a sample that comprises only one single nuclear species.

Further, Driehuys is silent about two-dimensional NMR spectroscopy but only discloses one-dimensional NMR spectroscopy. While one dimensional NMR spectroscopy might be suitable for a sample like atomic xenon, molecules like small organic molecules or even larger molecules like proteins contain an increased number of NMR active nuclei. As a consequence, the basic one-dimensional NMR spectrum becomes crowded with overlapping signals to an extent where analysis becomes impossible. Two-dimensional experiments are able to address this problem. However, since the above-mentioned problems are not arising for a compound like hyperpolarized Xe, this problem is not addressed by Driehuys.

Driehuys is also silent about a pulse sequence that uses a single scan as is recited by all of the claims of the instant application. Moreover, the pulse sequences described by Driehuys do not use an efficient trajectory in a  $t_S$ - $t_{IS}$  plane and produce a square array of observed points in a square portion of a two time space. The use of a single scan pulse sequence is of advantage since each rf-pulse destroys a part or the whole of the longitudinal magnetization (polarization) of the sample and said magnetization cannot be renewed by re-polarization (see also Driehuys col. 12, lines 35-39). Further, a pulse sequence which fully spans the area

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of interest in a single scan, i.e. use an efficient trajectory in a  $t_S$ - $t_{IS}$  plane and produce a square array of observed points in a square portion of a two time space is of advantage since a maximum of information from said area of interest can be obtained.

Therefore, as the claims of the present invention contain features which are not disclosed by Driehuys, and because Driehuys fails to disclose, teach, or suggest the present invention, Applicants respectfully submit the present invention is patenably distinct thereover. Reconsideration and withdrawal of the rejection are respectfully requested.

In view of the amendments and remarks hereinabove, Applicants respectfully submit that the instant application, including claims 1 and 14-18, is in condition for allowance. Reconsideration and withdrawal of the rejection are respectfully requested.

Any questions with respect to the foregoing may be directed to Applicants' undersigned counsel at the telephone number below.

Respectfully submitted,

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